

phenomena (1) by a consideration of the composition and properties of atmospheric air; or (2) in consequence of remarking the results of the analysis of certain pairs or series of chemical compounds, the composition of which illustrates the law of multiples.

The authors contend for the former view, and adduce the contents of the lecture note-book dated 1810; but these notes of lecture 17 contain evidence of confusion in the statements made by Dalton himself. In these notes he says (p. 14 of the book), "In order to reconcile or rather adapt this chemical theory of the atmosphere to the Newtonian doctrine of repulsive atoms or particulars, I set to work to combine my atoms upon paper," &c. (P. 15), "In 1801, I hit upon an hypothesis." This hypothesis relates to the mutual repulsion of gaseous particles. (P. 16), "Upon reconsidering this subject it occurred to me that I had never contemplated the effect of difference of size. . . . This idea occurred to me in 1805." (P. 17), The different sizes of the particles being once established, "a train of investigation was laid for determining the *number* and *weight* of all chemical and elementary principles which enter into any sort of combination one with another."

So that the atomic theory as applied to chemical combination took shape in Dalton's mind according to this version of the story in 1805. Yet according to another of the note-books, quoted p. 26, he was using symbols to express the atoms of elementary bodies in 1803. The authors notice this conflict of statement, but get rid of it by assuming 1805 to be a clerical error for 1803.

Thomson was probably wrong in attributing the origin of the atomic theory to the study of marsh gas and olefiant gas. But in his exposition of the Daltonian doctrine, prepared only a short time after his interview with Dalton, he illustrates the use of the atomic doctrine by reference to the oxides of nitrogen. This was in his third edition, published 1807. In his sixth edition he introduces the oxides of carbon as well as the oxides of nitrogen. Thomson, therefore, from the time of his interview with Dalton retained the impression that the genesis of the theory was intimately connected with the facts known to Dalton as to chemical combination in multiple proportions, though he was evidently not clear as to the particular case first considered. That it was the oxides of nitrogen which first attracted Dalton's attention is, however, probable from the fact that he refers to them in the following noteworthy passage which occurs in his paper on the atmosphere read at Manchester, November 12, 1802: "These facts clearly point out the theory of the process: the elements of oxygen may combine with a certain portion of nitrous gas, or with twice that portion, but with no intermediate quantity." The authors have succeeded in discrediting the story about marsh gas, but it still remains doubtful whether Dalton's recollections in 1810 of what occurred six or seven years before are more trustworthy than the impressions of Thomson received much earlier, when it is a question as to the order in which various considerations came before his mind in the long course of meditation which led to the adoption of his theory.

YOUR REVIEWER.

An Advance in Röntgen Photography.

SINCE my last communication I have been pursuing the study of the photography of the soft tissues in the living adult subject, and making attempts to see shadows of them on the fluorescent screen. In a previous communication I was able to state that I had accomplished these in the region of the neck, the tongue, hyoid bone, larynx, &c. Proceeding downwards, I have now photographed and seen shadows of the cardiac area. In the photograph the diaphragm is clearly indicated below; the pyriform shape of the cardiac area is well made out, the base downwards, apex upwards, and the right and left borders show the relationship to the spine and ribs. JOHN MACINTYRE.

179 Bath Street, Glasgow, May 9.

PROJECTS FOR ANTARCTIC EXPLORATION.

ON January 28, 1841, Captain James Clark Ross and his comrades on her Majesty's ships *Erebus* and *Terror*, saw for the first time the giant volcanoes, rising in latitude $78^{\circ} 30' S.$, which bear the names of the only vessels that ever sighted them.

Fifty-five years later we remain in possession of no

more information regarding these regions than was brought home by the discoverer. This is a circumstance absolutely unique in the modern history of geography. During these fifty-five years the map of Africa has developed from a *carte blanche* into a well-ordered delineation of mountains, lakes and rivers, even towns and villages the names of which are household words. In the far North the limits of the unknown have been and are still being strenuously pushed back. It is only in the far South that the explorer's march has been stayed, and during the last ten or fifteen years the importance of securing a farther advance in this direction has been given expression to, with increasing frequency and emphasis, by the scientific men of all countries. The latest and most weighty statement on the subject was the resolution of the Sixth International Geographical Congress, drafted in London by the leading geographers of Europe, to this effect:

"That the Congress record its opinion that the exploration of the Antarctic regions is the greatest piece of geographical exploration still to be undertaken. That, in view of the additions to knowledge in almost every branch of science which would result from such a scientific exploration, the Congress recommends that the scientific societies throughout the world should urge, in whatever way seems to them most effective, that this work should be undertaken before the close of the century."

It is clear to all scientific men that, although the recent experimental trips of Scottish and Norwegian whalers to the Antarctic regions have led to some distinct advances in our knowledge, and have rightly occupied a good deal of attention, they leave the question of serious exploration untouched. In the absence of a real expedition, we must continue to eagerly utilise every scrap of information which may be obtained by any means; but such trifles are only of provisional value. The drowning man may, for want of other floats, catch at straws, but the least critical spectator of this proverbial tendency would not argue that a life-belt was therefore unnecessary.

Antarctic exploration, if newspaper reports are to be trusted, has been commenced by the American Dr. Cook, who accompanied Lieutenant Peary on one of his journeys in Greenland, and has now got together a small scientific party on board two little sailing vessels of only 100 tons, with which he hopes to penetrate to the coast of Graham's Land and winter there. Weddell, in 1823, succeeded in reaching $74^{\circ} 15' S.$, in that neighbourhood, one of his vessels being only 65 tons, so that small size does not necessarily mean failure. If Dr. Cook has experienced ice-navigators with him, he will probably be able to effect a landing and collect some useful information. His equipment, however, is, we fear, inadequate to the task he has undertaken, and much must not be expected from it.

A more serious effort is announced as almost ready. It is to be commenced in September this year, under a flag which we believe has not hitherto appeared in polar regions, that of Belgium. The proposed expedition is being arranged by Lieut. A. de Gerlache, of the Berlin Navy, under the auspices of the Royal Belgian Geographical Society, and the expenses, which are estimated at £10,000, are to be met by public subscription. It is said that a large proportion of the money has been promised, the Brussels municipality have voted a grant; but until the whole of the cost is guaranteed, it would be rash to look upon this or any other expedition as a settled affair. A strong scientific staff is intended to accompany the vessel, which will probably try to get south along the east coast of Graham's Land.

In Germany the enthusiasm for Antarctic exploration has been gradually rising, and a strong Committee was appointed at the Eleventh German Geographical Congress, held last year at Bremen, to organise an expedition.

Dr. Neumayer, of the German Marine Observatory at Hamburg, and Herr G. Albrecht, of Bremen, are the Presidents, and the Secretary is Dr. Lindeman, who for many years has, through his editorship of the *Geographische Blätter*, kept the German public fully informed concerning all polar matters. This Committee has recently issued a detailed plan and estimates of a great German expedition to be sent out, not by the Government, but by the nation.

The objects of the expedition are defined as being the study of the meteorological and magnetic conditions of the South Polar area, geodetic observations, zoological, botanical and geological collections, the study of Antarctic ice, and the exploration of the still untouched polar region. For these purposes a station, in which observers can winter, would be fitted up either on the Antarctic continent or on one of the neighbouring islands, and one ship would remain in the nearest safe harbour which could be found, while the second vessel should spend the winter in cruising round the Southern Ocean making oceanographical researches.

The point at which an effort should be made to break new ground within the Antarctic circle was carefully considered, and the region between 70° and 85° E., *i.e.* south of Kerguelen, was selected, for the excellent reason that no previous serious effort has been made south of the Indian Ocean. Special value is placed upon magnetic and meteorological observations at Kerguelen or McDonald Island, because these lie nearly equidistant between the great observatories of Cape Town and Melbourne to west and east, and at a corresponding distance from the observatory of Mauritius to the north.

The recent publication by Dr. Murray, in the *Transactions* of the Royal Society of Edinburgh, of a detailed account of the work of the *Challenger* in the neighbourhood of Kerguelen, with lists of all the species obtained by the collectors on board, will be of service in guiding the biological work of the expedition, while at the same time it furnishes a compact summary of all that is at present known of the marine life and deposits on the edge of the Antarctic.

The German expedition is intended to include two vessels of about 400 tons, no doubt of the type of steam whalers, each carrying four officers, a scientific staff of four, and a crew of twenty-two. The ships would be absent for about three years, and would spend two winters in the Antarctic regions. The total cost is estimated at 950,000 marks, or £47,500, and the German nation is appealed to to find this money, the report of the Committee as published in the *Verhandlungen* of the Berlin Geographical Society concluding:

"The leading Powers of the civilised world appear to be preparing to attempt the solution of the great problem of the geographical conditions of the Antarctic regions. The German nation, always a leader in the solution of geographical problems, cannot possibly lag behind in this contest, the less so because a great and successful voyage of discovery would largely increase the reputation of Germany on the seas, and bring the greatest honour to the German name."

Beside this patriotic sentiment, the practical outcome of which the scientific world and not Germany alone looks for with hope and confidence, we may place a remark from another continental scientific paper, which from the reported refusal of the British Government to consider a proposal for a national expedition, drew the not illogical conclusion that the whole strength of the British Navy had to be brought under requisition for the purpose of making a warlike display before the great Powers. The President of the Royal Geographical Society at a recent meeting observed that "never was there a more favourable opportunity than the present for our Government to demonstrate its confidence in its own naval resources, by detaching a small expedition for special service in

Antarctic research." The country is always ready to applaud and support a movement for the honour of the flag and the popularisation of the navy. If a contest between the great Powers is called for by the unthinking of several nations, what contest could be better than friendly rivalry in the advancement of science by maritime exploration? Around the South pole there is room for many simultaneous expeditions. Ross from Britain, Wilkes from the United States, and Dumont D'Urville from France were together in Antarctic waters fifty-six years ago, and the scientific world would gladly hail the early repetition of such history.

The Antarctic Committee of the Royal Geographical Society having been warned that an appeal to Government is not likely to be favourably entertained, has not as yet come to a decision as to its future action. The agitation for a complete scientific expedition will certainly not be allowed to rest. The only want is money; and surely some means can be found to supply this. The necessary amount would never have been missed from the surplus recently at the command of the Chancellor of the Exchequer. If the 600,000 professional men of the British Islands were to subscribe half-a-crown each, the resulting £75,000 would suffice for a very valuable expedition. If a few of the largest daily papers were to start a popular shilling subscription, they might without expense to their proprietors confer a priceless boon on science, and stimulate a healthy excitement in the public. There surely remain in this country some men—at least one man—able to do for the South Polar region what Mr. Harmsworth is so generously doing for the North; and to induce such potential benefactors to make their names great in history should not be an insurmountable task. The last and greatest feat of exploration on our planet may still be done, and allow the nineteenth century to close on a *Terra Cognita*; and the doing of it may still be secured for our country. If the opportunity is not taken now, it may not occur again for us, and the inevitable enrichment of science will redound to the glory of some more far-sighted, more patriotic, and less selfish people. It is an error surprisingly common, and every day becoming more ludicrously erroneous, that only Englishmen are capable of great deeds of daring and perseverance. If we are to retain our pre-eminence in polar exploration, we shall have to fight for it, not with armoured ships costing a million pounds apiece, but with a few old wooden whalers that may be purchased, manned, and equipped for a three years' cruise for less than a tenth part of that sum. Nothing less than a well-equipped scientific expedition can be looked upon as sufficient for the purpose in view.

Mr. T. Gilbert Bowick, of 2 Savile Row, is, as mentioned in a recent number of *NATURE*, at present completing arrangements for securing a passage for a party of scientific men on a whaling expedition, which is expected to set out in the autumn of this year, and will endeavour to land the passengers near Cape Adare (lat. $71^{\circ} 45'$ S.) in November 1896, returning for them in December 1897. Mr. C. E. Borchgrevink, whose Antarctic voyage is described in *NATURE* (vol. lii. p. 375), is proposed as the leader of the scientific party, which is intended to include twelve members. The plan of work involves the exploration of the coast of South Victoria Land and shallow-water dredging from a small steamer, which will be left at the winter quarters. Most of the work will naturally consist of meteorological, biological and geological observations near the station at Cape Adare, but a *ski*-journey is projected over the ice-cap in the direction of the magnetic pole. This expedition will, we hope, be undertaken, and if a landing can be made and a station established, the results will be of great value; but such an expedition, useful as it must be, is not sufficient. The alternative seems to be to allow the German and Belgian expeditions the full glory of renewing

serious work in the Antarctic, or to equip an adequate British expedition to co-operate with them by conducting simultaneous observations on the other side of the unknown area. An expedition a few years hence would be much less serviceable, because the value of consecutive work is at most additive, while that of simultaneous work is as the square, or some higher power, of the numbers engaged.

For the first time a south-polar map on a good scale is now available, thanks to the enterprise of Herr von Haardt of Vienna, and his publisher Hölzel. It is on a polar projection, and the scale of 1 : 10000000, approximately 160 miles to one inch. A special feature is made of ice-conditions and ocean currents, and the tracks of all the important southern voyages are laid down. But the most impressive feature is the vast central blank wherein lie hitherto untouched gold-fields of scientific data.

HUGH ROBERT MILL.

THE HEIGHT OF LUMINOUS CLOUDS.

IN the *Astronomischen Nachrichten* (No. 3347), Dr. O. Jesse gives a short condensed account of some of the main results that have been obtained from a discussion of all the observations made during the years 1889-91. The full discussion, entitled "Die leuchtenden Nachwolken," will, however, soon appear in the Publications of the König. Sternwarte in Berlin.

Perhaps the most interesting part of this work is that which is based, for the most part, on a series of photographs taken simultaneously at Steglitz, at the Urania Observatory, at Nanen, and at Rathenow, which brings out prominently the fact that the height of these clouds since the beginning of the phenomenon in 1885 has remained for the most part constant. The first table given by Dr. Jesse shows to a remarkable degree this almost constant value obtained for the mean height of the clouds, the actual total mean value being 82.08 kilometres ± 0.009 . The apparent constancy in the value thus obtained for the height of these luminous masses is even more surprising when it is remembered that the observations were not made exactly simultaneously, a task by no means easy, so that the fast movements of the clouds were liable to influence the results to some marked extent.

An examination of the facts, however, seems to indicate that if the observations had been made strictly simultaneously, then the zone in which these nocturnal masses move might be considered narrower than the observations have as yet indicated.

As the observations used in this discussion were made for the most part after midnight, the computed value of the height to which they extend can only be said to hold for those clouds observed at this time. As a matter of fact, however, the few observations made before midnight indicate also roughly the same elevation as above obtained, but the paucity of the observations renders impossible any degree of certainty being attached to the result obtained.

Another part of the investigation related to the question as to whether the apparent height of the clouds had always been the same as that deduced from the observations extending over the years 1889-91. To answer this, an examination of all the observations since 1885 was made to see whether the zenith distances for the same depression of the sun below the horizon had always been the same; which would necessarily be the case if the distance of the clouds from the earth's surface be assumed to be nearly always constant.

The observations employed were those made by Backhouse, of Sunderland, in Kissingen, and by Dr. Jesse himself in Steglitz. A condensed form of the table given by the latter is as follows:—

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Number of observations.	Depression of sun below horizon.	Zenith distance of the clouds.	Probable error of observation.
6	9.9	69.9	2.5
9	11.2	77.8	1.4
8	11.8	80.3	0.8
5	12.5	81.7	0.6
7	13.8	85.0	0.5

In the year 1889 the phenomenon of luminous clouds occurred on July 2, and was, fortunately, unusually bright, rendering it possible to make numerous accurate measures; these Dr. Jesse gives in the following table, and compares the results with those given above. The numbers are as follows:—

The Difference of the Zenith Differences on July 2, 1889, from those found in earlier Years.

Depression of sun below horizon.	Zenith distance of the highest point of the clouds.	Difference.	Variation in height for 1° error in measured Z.D.
	1889, July 2.	From table.	km.
11.4	77.5	78.6	+1.1
11.7	79.1	79.9	+0.8
12.6	82.7	82.0	-0.7
12.9	83.1	82.7	-0.4

After allowing for the numerous sources of error which might account for some part of the large differences in the fourth column, Dr. Jesse adds that the magnitudes of these are such as to lead him to assume another source of explanation, namely, in the arrangement of the particles composing the clouds themselves. It is probable that the clouds vary very considerably in thickness vertically, which would also affect the differences to some extent; thus with decreasing zenith distances a largely increased impression on the measured zenith distance of the clouds would result.

Setting aside, however, the question of the origin of these small differences, the important main result of the investigations still remains intact, namely, that from the years 1885-91 the luminous clouds have always had nearly the same mean height, namely 82 kilometres, or about 51 miles.

W. J. S. L.

THE BISHOP OF RIPON ON HUXLEY AND SCIENCE.

AT a meeting convened by the Leeds Philosophical and Literary Society, held a few days ago, a resolution was unanimously adopted appointing a Committee, consisting of the Mayor, the members of the Council of the Philosophical and Literary Society, and all others who volunteered to join, for the purpose of raising subscriptions in aid of the Huxley Memorial Fund. We rejoice at the formation of the Leeds Committee, but another cause of gladness is the address delivered by the Bishop of Ripon in support of the object for which the meeting was held. In no uncertain voice, Dr. Boyd Carpenter declared himself a supporter of the principles which guided Huxley's noble life, and proclaimed the righteousness of scientific truth. It is not often that dignitaries of the Church speak so boldly for science as Dr. Carpenter did at the Leeds meeting; and on this account, and also because many of our readers will be glad to see this public recognition of Huxley's integrity of thought and purpose, we gladly print a report, though an abridged one, of the address.

It would not be surprising to discover there are many in this meeting who would be prepared to point out one or two special and specific objections or difficulties they have felt in regard to Prof. Huxley's teaching. I think, however, you will agree with me that if we demand complete harmony of opinion, that stupid unanimity which betrays either ignorance or thoughtlessness, before we dare to speak in honour of any one whose